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AND SUBSPECIES OF MAMMALS
FROM PANAMA

BY

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DESCRIPTIONS OF TWELVE NEW SPECIES AND SUB-SPECIES OF MAMMALS FROM PANAMA¹

By E. A. GOLDMAN

In the early part of 1911 a collection of 368 mammals was made by me while engaged in the biological survey of the Canal Zone, and adjacent parts of Panama, undertaken by the Smithsonian Institution in coöperation with several government departments, including the War Department and the Department of Agriculture. This collection, representing between 40 and 50 genera, includes 12 new species and subspecies which are here published in advance of a general report on the mammals of the region. Nine of the new forms are from the Canal Zone, and the others were taken while on a visit, in March, to the mountains near the headwaters of the Chagres River.

Acknowledgments are due, especially, to Col. George W. Goethals, U. S. Army, and others connected with the administration of the Canal Zone, who aided materially in the prosecution of the work of the survey. I am also indebted to Dr. J. A. Allen for the privilege of making comparisons with types and other material in the American Museum of Natural History, and to Mr. Samuel Henshaw for the loan of specimens from the Bangs Collection in the Museum of Comparative Zoölogy.

MARMOSA ISTHMICA, sp. nov.

Type from Rio Indio, near Gatun, Canal Zone, Panama. No. 170969, male adult, U. S. National Museum (Biological Survey Collection), collected by E. A. Goldman, February 16, 1911. Original number 20889.

General characters.—Size large, about as in *chapmani* and *ruatanica*, larger than *mexicana*, *zeledoni* or *mitis*; color about as in *chapmani*, but skull with narrower rostrum, slightly smaller teeth, and decidedly smaller audital processes of alisphenoids.

Color.—General color of upper parts brownish cinnamon, lighter on middle of face, and becoming dull ochraceous buff on sides of

¹This paper is the sixth dealing with the results of the Smithsonian Biological Survey of the Panama Canal Zone.

neck and flanks; under parts between cream buff and pinkish buff, this color extending to roots of hairs; ears brown; orbital area black; fore feet brownish to base of toes; hind feet and toes of fore feet dull whitish; longer hairs at base of tail on under side tawny ochraceous; tail light brownish.

Skull.—Similar in general to that of *chapmani*, but rostrum narrower; nasals less prolonged posteriorly; auditory processes of alisphenoids decidedly smaller; teeth slightly smaller. Differing from that of *ruatanica* in narrower rostrum and more strongly developed suborbital ridges.

Measurements.—Total length, 385 mm.; tail vertebræ, 215; hind foot, 28. *Skull* (type): Greatest length, 43.5; condylobasal length, 42.7; zygomatic breadth, 23.7; nasals, 20 x 5.1; interorbital breadth, 6.2; palatal length, 21.5; upper molariform toothrow, 13.8; three anterior molariform teeth, 6.2.

Remarks.—A single specimen of this large pale colored species was trapped in an old banana plantation only a few feet above sea level.

METACHIRUS NUDICAUDATUS DENTANEUS, subsp. nov.

Type from Gatun, Canal Zone, Panama. No. 172732, male adult, U. S. National Museum (Biological Survey Collection), collected by E. A. Goldman, January 12, 1911. Original number 20837.

General characters.—Most closely allied to *M. n. colombianus*; color paler, less tawny; skull differing in detail.

Color.—General color of upper parts, including outer sides of hind legs, near wood brown, darkened along back by blackish, the black predominating in a narrow line down middle of rump to tail; median area on top of head glossy black, this color fading gradually by admixture with lighter hairs along a narrowing line reaching anteriorly to nose and posteriorly to back of neck; orbital rings and sides of muzzle blackish; cheeks, supraorbital spots, and area about ears ochraceous buffy, the color richest about ears; shoulders suffused with plumbeous, the basal color being darker and showing through; under parts, including inner sides of limbs, yellowish white; outer sides of fore limbs grayish, tinged with buffy; fore feet mainly dusky, becoming abruptly whitish along outer side of tarsus and on toes; hind feet dull white; tail dusky above, lighter below, becoming whitish all round near tip.

Skull.—Similar in general to that of *colombianus*, but dentition heavier; first, second, and third upper molars more deeply emarginate externally; zygomata lighter.

Measurements.—Type: Total length, 597 mm.; tail vertebræ, 332; hind foot, 48. *Skull* (type): Greatest length, 63; condylobasal length, 61.7; zygomatic breadth, 31.7; nasals 30 x 9.5; interorbital breadth, 9.3; palatal length, 34.5; upper molariform toothrow, 22.2.

Remarks.—In Panama this form seems to be a much rarer animal than *M. fuscogriseus*, which occurs at the same localities and seems to have similar habits. A specimen taken at 2500 feet elevation on Cerro Azul, near the headwaters of the Chagres River is like those from near sea level at Gatun.

Specimens examined.—Total number, 4, from localities as follows: Canal Zone: Gatun (type locality), 2. Panama: Cerro Azul, 1. Costa Rica: Angostura, 1.

SCIURUS VARIEGATOIDES HELVEOLUS, subsp. nov.

Type from Corozal, Canal Zone, Panama. No. 171540, male adult, U. S. National Museum (Biological Survey Collection), collected by E. A. Goldman, June 15, 1911. Original number 21166.

General characters.—Similar in general to *dorsalis* and *variegatoides*, but limbs and under parts paler in the grizzled-back phase; premolars $\frac{1}{1}$ (premolars $\frac{2}{1}$ in *dorsalis*).

Color.—Phase with grizzled back: Top of head and back mixed black and pale buff, the mixture producing a grizzled effect; muzzle and sides of head buffy grayish, much paler than top of head; under parts and limbs pale buff, the color richest on outer sides of forearms, along flanks and on lower base of tail, becoming somewhat paler on feet; ears broadly edged with black anteriorly, more narrowly posteriorly, the ear patches pale buff or white, tail above at base like back, rest of upper side black and white, the hairs broadly tipped with the latter color, below varying along median line from pale ochraceous buff to pale cinnamon-rufous, bordered with black and edged with white. *Variation:* One specimen in worn pelage, perhaps representing the black-backed phase seen in *dorsalis*, has the under parts and limbs uniform pale buffy gray, and the top of head and back blackish in patches. The top of head and back are more uniform in color, and the dark dorsal area broader than in typical examples of *dorsalis* in this phase.

Measurements.—Type: Total length, 508 mm.; tail vertebræ, 255; hind foot, 63. An adult topotype: 540; 274; 67. *Skull* (type): Greatest length, 57.7; condylobasal length, 53; zygomatic breadth, 34.2; nasals, 19.3; interorbital breadth, 21; palatal length, 26.7; maxillary toothrow (small anterior premolar absent), 10.7.

Remarks.—The squirrels of the *S. variegatoides* group are very imperfectly known. The group includes several rather localized forms which in color present a remarkably wide range of individual variation. Large series of typical examples are much needed to make clear many doubtful points. The Panama form is doubtless most closely allied to *dorsalis* of northern Costa Rica, but it seems to differ from typical *variegatoides* mainly in the paler color of the under parts in the phase with grizzled back. The three specimens obtained, two adults and one about half-grown, all lack the small upper premolar usually present in the squirrels of this group.

Specimens examined.—Three, all from the type locality.

MICROSCIURUS ALFARI VENUSTULUS, subsp. nov.

Type from Gatun, Canal Zone, Panama. No. 171030, female adult, U. S. National Museum (Biological Survey Collection), collected by E. A. Goldman, March 1, 1911. Original number 20955.

General characters.—Closely allied to *alfari*, but general color less rufescent. Similar to *browni*, but darker above and below; tail edged with orange rufous instead of grayish white; throat more rusty brown.

Color.—Upper parts, including outer sides of limbs, brownish black, finely grizzled with cinnamon-rufous, or rusty reddish, the general effect resulting from overlapping of black-tipped hairs with rusty reddish subterminal bands; head, and especially cheeks, clearer cinnamon-rufous than back; under parts, including inner sides of limbs, grayish brown, somewhat irregularly suffused with cinnamon-rufous; ears brownish at tips, clothed on inner base with a partly concealed patch of moderately long cream-buffy hairs; feet dark rusty brownish; tail coarsely grizzled black and cinnamon-rufous, rather broadly edged with the latter color.

Skull.—Similar to that of *alfari*, but nasals narrower posteriorly and jugal weaker than in the type of that species.

Measurements.—Type: Total length, 250 mm.; tail vertebræ, 102; hind foot, 40. *Skull* (type): Greatest length, 37; condylobasal length, 32.8; zygomatic breadth, 23.2; nasals, 10.5; interorbital breadth, 14; palatal length, 15; maxillary toothrow (small anterior premolar absent), 5.5.

Remarks.—The pygmy squirrels typified by *alfari* and usually assigned to the subgenus *Microsciurus* constitute a group that seems to merit full generic recognition under this name. Aside from the subgeneric characters currently recognized the group is charac-

terized by simpler dentition than *Sciurus*; the small cusps intermediate in position between the larger tubercles on the outer side in the large upper molariform teeth in *Sciurus* are absent in *Microsciurus*. The skull of the type of *venustulus* lacks the small anterior premolar usually present in *Microsciurus*.

Specimens examined.—Total number, 3, from the following localities:

Canal Zone: Gatun, 2.

Panama: Porto Bello, 1.

ORYZOMYS IDONEUS, sp. nov.

Type from Cerro Azul (altitude 2500 feet), near the headwaters of the Chagres River, Panama. No. 171106, female adult U. S. National Museum (Biological Survey Collection), collected by E. A. Goldman, March 26, 1911. Original number 21010.

General characters.—A large species of the subgenus *Melanomys*, allied to *columbianus*, but larger, with shorter tail; color more rufescent. Differing from *phaeopus* and *chrysomelas* in larger size and decidedly paler color.

Color.—Upper parts cinnamon-rufous evenly mixed with black, becoming somewhat paler along flanks; outer sides of limbs dark brownish cinnamon; under parts dark tawny ochraceous, the under color showing through; feet and tail thinly haired, the hairs and epidermis blackish.

Skull.—Closely resembling that of *columbianus*, but decidedly larger: sides of frontals more projecting as supraorbital shelves. Differing from those of *phaeopus* and *chrysomelas* mainly in decidedly larger size.

Measurements.—Type: Total length, 218 mm.; tail vertebræ, 88; hind foot, 30. *Skull* (type): Greatest length, 31.5; condylobasal length, 29.5; zygomatic breadth, 17.5; nasals, 12.5; interorbital breadth, 6.5; interparietal, 8.7 x 2.5; incisive foramina, 4.8; length of palatal bridge, 6.5; maxillary toothrow, 4.8.

Remarks.—A single specimen of this rice rat was taken in the humid forest on Cerro Azul. The group to which it belongs bears a marked external resemblance to some species of *Akodon*, and this fact probably led to the publication of *Akodon columbianus* Allen (= *Oryzomys columbianus*). *O. columbianus* is closely allied to *O. phaeopus* and *O. chrysomelas*, and these forms, perhaps along with the one described above, may prove to be intergrading geographic races all assignable to a single widely ranging species.

ORYZOMYS FRONTALIS, sp. nov.

Type from Corozal, Canal Zone, Panama. No. 171531, female adult, U. S. National Museum (Biological Survey Collection), collected by E. A. Goldman, June 20, 1911. Original number 21172.

General characters.—Similar to *O. flavicans*, but decidedly larger; color darker; supraorbital ridges projecting farther over orbits.

Color.—Upper parts between cinnamon-rufous and orange-rufous, darkened on head by more abundant admixed dusky hairs, becoming paler and duller along sides; under parts, including lips and inner sides of limbs white; ears and fore feet brownish; hind feet dull white; tail dusky all round.

Skull.—In general form closely resembling that of *flavicans*, but much larger; supraorbital ridges more developed, the edges less upturned and shelving farther over orbits.

Measurements.—Type: Total length, 309 mm.; tail vertebræ, 161; hind foot, 30. *Skull* (type): Greatest length, 35.5; condylobasal length, 33; zygomatic breadth, 18; nasals, 12; interorbital breadth, 6.7; interparietal, 10.2 x 5; incisive foramina, 6; length of palatal bridge, 6.7; maxillary toothrow, 5.

Remarks.—The type and only specimen obtained of this large species shows that the animal is clearly a member of the *flavicans* group. It may be not very unlike *O. tectus* Thomas, of Bogava, Chiriquí, which is said to have remarkably expanded supraorbital ridges, but the latter is described as having fulvous upper lips and buffy under parts and feet. The species requires no close comparison with *O. flavicans illectus* which is more orange buffy in color, and has a different skull—the zygomata much less squarely spreading anteriorly, and supraorbital ridges less developed. *O. panamensis* was described from very near the same locality, but was placed in the *laticeps* group.

ORYZOMYS BOMBYCINUS, sp. nov.

Type from Cerro Azul (altitude 2500 feet), near the headwaters of the Chagres River, Panama. No. 171105, male adult, U. S. National Museum (Biological Survey Collection), collected by E. A. Goldman, March 26, 1911. Original number 21009.

General characters.—Similar in color to *carrikeri*, but pelage much longer, and skull more slender. Somewhat like *talamancæ*, but color much darker, and pelage longer and softer; skull with more slender rostrum, and differing in other details.

Color.—Upper parts varying from vandyke brown to mars brown of Ridgway, shaded with black along median line of dorsum, and becoming somewhat paler along sides; face blackish; outer sides of limbs dark brown; under parts dull white, the plumbeous basal color of fur showing through; feet thinly haired, rather dark flesh-colored; tail brownish above, grayish below.

Skull.—Similar in general to that of *talamancæ*, but rostrum more slender; parietals bounded laterally by temporal ridges, instead of extending across them and encroaching on squamosals as in *talamancæ*; frontal region more depressed near posterior ends of nasals.

Measurements.—Type: Total length, 252 mm.; tail vertebræ, 127; hind foot, 32. *Skull* (type): Greatest length, 31.3; condylobasal length, 28.8; zygomatic breadth, 15.4; nasals, 12.2; interorbital breadth, 5.5; interparietal, 8.8 x 4; incisive foramina, 5; length of palatal bridge, 6.2; maxillary toothrow, 4.7.

Remarks.—This rice rat is a dark-colored, long-haired mountain member of the widely ranging *laticeps* group, which includes a number of forms in northern South America, and reaches northward as a group, through Middle America to Mexico. *Oryzomys bombycinus* is remarkable for the length and softness of its pelage.

Specimens examined.—Total number, 4, from localities in Panama, as follows: Cerro Azul (type locality), 3; Cerro Brujo, 1.

ORYZOMYS GATUNENSIS, sp. nov.

Type from Gatun, Canal Zone, Panama. No. 171034, male young, U. S. National Museum (Biological Survey Collection), collected by E. A. Goldman, March 7, 1911. Original number 20967.

General characters.—Allied to *richmondi*; color paler; skull decidedly broader between orbits, the sides of frontals more projecting, interparietal smaller.

Color.—Upper parts between raw umber and tawny olive of Ridgway, mixed with black, the general color becoming brownish on the face and somewhat buffy along flanks; under parts dark pinkish buff, the plumbeous basal color of fur showing through; feet thinly haired, flesh colored; tail grayish brown above, lighter below.

Skull.—Similar in general to that of *richmondi*, but frontal region broader, the lateral margins more developed as supraorbital shelves; interparietal much less extended antero-posteriorly; nasals more

prolonged posteriorly beyond premaxillæ: dentition about as in *richmondi*.

Measurements.—Type: Total length, 224 mm.; tail vertebræ, 115; hind foot, 31.5; *Skull* (type): Greatest length, 27.7; condylobasal length, 24.8; zygomatic breadth, 14.5; nasals, 10.2; interorbital breadth, 5.3; interparietal, 7.3 x 1.5; incisive foramina, 5.6; length of palatal bridge, 5.2; maxillary toothrow, 5.

Remarks.—This species seems to require comparison only with *richmondi*. It is represented by a single specimen taken in an abandoned sugar plantation on the bank of the Chagres River.

ZYGODONTOMYS CHERRIEI VENTRIOSUS, subsp. nov.

Type from Tabernilla, Canal Zone, Panama. No. 171098, male adult, U. S. National Museum (Biological Survey Collection), collected by E. A. Goldman, March 12, 1911. Original number 20975.

General characters.—Similar to *cherriei*, but larger; general color paler and grayer, the back more uniform, less distinctly darkened along median line.

Color.—Upper parts grayish brown, darkest and more or less suffused with yellowish, or light rusty brown, on median dorsal area, becoming paler and grayer along flanks and outer sides of limbs; under parts dull creamy white, or gray, the fur short, and the plumbeous basal color showing through; ears brownish, overlapped at anterior base by rather long rusty hairs; feet white; tail nearly naked, grayish above, whitish below.

Skull.—About like that of *cherriei*, but larger.

Measurements.—Type: Total length, 240 mm.; tail vertebræ, 104; hind foot, 28. Average of ten adult topotypes: 236 (220-255); 102 (94-109); 27.3 (26.5-28). *Skull* (average of four adults): Greatest length, 31.7 (30.5-32.5); condylobasal length, 29.6 (28.5-31); zygomatic breadth, 16.4 (16-17.2); nasals, 12.2 (11.2-13.5); interorbital breadth, 5 (5-5.2); interparietal, 7.7 x 3 (6.3 x 3-9 x 3.5); incisive foramina, 6.7 (6.2-7); length of palatal bridge, 5.5 (5.5-5.5); maxillary toothrow, 4.6 (4.5-4.8).

Remarks.—This form, representing the genus *Zygodontomys* in the Canal Zone, seems to be the most abundant murine rodent in the grassy clearings and second growth jungle of the region. It was not obtained in the heavy forest.

Specimens examined.—Total number, 23, from the following localities in the Canal Zone: Tabernilla (type locality), 15; Gatun, 8.

HETEROMYS PANAMENSIS, sp. nov.

Type from Cerro Azul (altitude 2800 feet), near the headwaters of the Chagres River, Panama. No. 171107, male adult, U. S. National Museum (Biological Survey Collection), collected by E. A. Goldman, March 23, 1911. Original number 20999.

General characters.—Allied to *repens*, but color still darker; fore feet blackish, instead of white, to near base of toes; ankles dusky all round; an ochraceous buffy lateral line sometimes present; sole of hind foot naked, six-tuberculate.

Color.—Ground color of upper parts blackish, nearly clear black on lower part of rump and outer sides of hind legs, becoming slaty grayish along flanks and outer sides of fore legs, the slender ochraceous buffy hairs abundant and producing a grizzled effect; ochraceous buff lateral line present in some specimens, absent in others; under parts white, sometimes suffused with pale buff; fore feet slaty grayish to near base of toes; ankles and proximal third of metatarsus dusky all round; distal two-thirds of metatarsus, and toes of fore and hind feet, whitish; tail varying from blackish above and whitish below to dark nearly unicolor all round.

Skull.—Similar to that of *repens*, but rostrum broadening more abruptly to zygomatica; interparietal broader; lateral wings of supraoccipital narrower, less developed over mastoids.

Measurements.—*Type*: Total length, 283 mm.; tail vertebræ, 148; hind foot, 35. *Skull* (*type*): Greatest length, 35.5; zygomatic breadth, 17.1; interorbital breadth, 9.4; nasals, 14.4; width of braincase, 15.2; interparietal, 10 x 5.5; maxillary toothrow, 5.2.

Remarks.—On the mountains near the headwaters of the Chagres River this very dark spiny pocket mouse was found inhabiting the forests from 2000 feet upward to the summit at about 3000 feet altitude. The same species was also obtained at about 2000 feet altitude on Cerro Brujo, near the north coast. It is more nearly related to *repens* of Chiriquí, than to *zonalis*, a near geographic neighbor of the lowlands in the Canal Zone.

Specimens Examined.—Six, all from Panama, as follows: Cerro Azul (*type locality*), 5; Cerro Brujo, 1.

HETEROMYS ZONALIS, sp. nov.

Type from Rio Indio (near Gatun), Canal Zone, Panama. No. 170976, female adult, U. S. National Museum (Biological Survey Collection), collected by E. A. Goldman, February 15, 1911. Original number 20885.

General characters.—Size about as in *desmarestianus*, but color darker, the slender hairs paler and less conspicuous among the bristles over dorsum; lateral line absent; white of under parts continuous along inner side of hind leg to foot; skull massive; maxillary root of zygomatica broad and heavy; interparietal rather narrow, with a well-developed anterior angle, and a small posterior median notch.

Color.—Upper parts blackish, becoming dark mouse gray along flanks and outer sides of limbs, the slender hairs inconspicuous among the black-tipped bristles; under parts, feet, and a line down inner side of hind leg to metatarsus, white; tail blackish or brownish above, whitish below, except at base where it is dark all round as usual in the group.

Skull.—Similar to that of *desmarestianus*, but interparietal with a more prominent anterior angle, and a posterior median notch (the latter absent in *desmarestianus*); parietals less extended laterally across temporal ridges; dentition about the same.

Measurements.—Type: Total length, 263 mm.; tail vertebrae, 134; hind foot, 35. *Skull* (type): Greatest length, 37; zygomatic breadth, 17; interorbital breadth, 10; nasals, 15.2; width of braincase, 15.2; interparietal, 8.2 x 5; maxillary toothrow, 5.5.

Remarks.—Although so widely separated geographically this species seems more like typical *desmarestianus* of Guatemala than like its near neighbors in Panama. It lives at low elevations on rocky heavily forested hills in the northern end of the Canal Zone.

Specimens examined.—Four, all from the vicinity of the type locality.

HOPLOMYS GOETHALSI,¹ sp. nov.

Type from Rio Indio, near Gatun, Canal Zone, Panama. No. 170972, young female, U. S. National Museum (Biological Survey Collection), collected by E. A. Goldman, February 16, 1911. Original number 20888.

General characters.—In size and color similar to *truei* and *gymnurus*; skull with heavier zygomatica than either, the jugal decidedly broader, with inferior border projecting posteriorly in a well defined hook (absent in *truei* and *gymnurus*).

¹ Named in honor of Col. George W. Goethals, U. S. Army, Chairman and Chief Engineer of the Isthmian Canal Commission, whose courtesy and assistance have contributed so much to the success of the Smithsonian Biological Survey of the Panama Canal Zone.

Color.—Ground color of upper parts cinnamon-rufous, darkened on top of head and along median line of neck by slender bristles which are replaced from near shoulders to rump by stout, anteriorly-grooved, black-tipped spines projecting beyond and overlying the finer hairs; cheeks and outer sides of fore limbs grayish brown, the cheeks in a fully adult example suffused with cinnamon-rufous; outer sides of hind limbs blackish; under parts white, interrupted in some specimens by a more or less complete pectoral band; nose and sides of muzzle blackish; ankles dark all round; inner side of metatarsus and three inner digits whitish, outer side and two outer digits brownish; tail blackish above, whitish below.

Skull.—General form resembling that of *truei*, but jugal more extended vertically, the inferior border more produced anteriorly, reaching nearer to antorbital foramen, and more prolonged posteriorly to form a distinct hook. Similar to *gymnurus*, but parietals more developed below temporal ridges; squamosal reaching farther along lateral ridges near frontoparietal suture; audital bullæ larger; zygomata differing in about the same characters as from *truei*; dentition the same as in the type species of the genus.

Measurements.—Type: Total length, 391 mm.; tail vertebræ, 153; hind foot, 54. An old male topotype: 529; 244; 62.5. *Skull* (type): Condyllobasal length, 51.6; zygomatic breadth, 29.2; interorbital breadth, 13; palatal length, 20; length of palatal bridge, 11.8; width of jugal near middle, 3.8; maxillary toothrow, 9.3.

Remarks.—The Isthmian representative of this genus agrees closely with *truei* and *gymnurus* in color and remarkably stout spiny armature, but is readily distinguished by the cranial characters pointed out. The posterior prolongation of the lower border of the jugal to form a process or hook is a character present also in some species of *Præchimys*, and absent in others.

Specimens examined.—Three, from the type locality.